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EFFECT OF HYDROLYSIS OR OTHER DEGRADATIVE PROCESS ON TENSILE STRENGTH, MOISTURE REGAIN, FOLDING ENDURANCE OR OTHER PHYSICAL PROPERTIES OF CELLULOSE FIBERS, FABRIC OR PAPER AS RELATED TO DEGREE OF POLYMERIZATION

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PREFACE

This annotated bibliography on "The Effect of Hydrolysis or Other Degradative Process on Tensile Strength, Moisture Regain, Folding Endurance or Other Physical Properties of Cellulose Fibers, Fabric or Paper as Related to Degree of Polymerization" was prepared by searching the Abstract Bulletin of The Institute of Paper Chemistry (ABIPC) from Volume 33 (1962) through Volume 44(7) (Jan., 1974).

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EFFECT OF HYDROLYSIS OR OTHER DEGRADATIVE PROCESS ON TENSILE STRENGTH, MOISTURE REGAIN, FOLDING ENDURANCE OR OTHER PHYSICAL PROPERTIES OF CELLULOSE FIBERS, FABRIC OR PAPER AS RELATED TO DEGREE OF POLYMERIZATION

ABIPC Vol. 33

9969. ANTONOVSKIĬ, S. D., CHOCHIEVA, M. M., and ZHDANEEVA, Z. A. **The effect of bleaching on the degree of polymerization of low-viscosity dissolving pulp.** Bumazh. Prom. 38, no. 2: 17-19 (Feb., 1963). [Russ.]

The std. requirements for dissolving pulps to be converted into viscose by the one-stage process are an α-cellulose content not less than 86%, a D.P. of 400-450, and a xanthate visc. of 70-80 mp. To det. the effect of bleaching on the D.P. and fractional cpn. of dissolving pulps, a kraft prehydrolysis pulp made from larchwood (*Larix kurilensis* Mayr), contg. 92.9% α-cellulose, 3.43% pentosans, and having a cuam visc. of 106 mp., was bleached by the flg. two processes: two-stage chlorination, alkali refining, two-stage hypochlorite bleaching, and acidification; two-stage chlorination, alkali refining, and two-stage ClO_2 bleaching. The bleached pulps obtained by the first and second bleaching methods had a visc. of 77 and 87 mp., a brightness of 84 and 91%, an ash content of 0.12 and 0.07%, and a pentosan content of 2.94 and 2.72%, resp. The α-cellulose contents of the pulps were the same (93.82%), and both had good filterability charact. The D.P. distribution curve of the unbleached pulp had three maxima, at 700, 1000, and 1400. It contained 9% of the low-mol. fraction (D.P. less than 200), 24% of high-mol. fraction (D.P. more than 1200), and 21% of the fraction with D.P. 200-600, corresponding to the std. requirements for low-visc. dissolving pulp. Pulp bleached with hypochlorite contained 24% low-mol. fraction, 17% of high-mol. fraction, and 30% of the 200-600 fraction. Pulp bleached with ClO_2 contained 13, 21, and 29%, resp., of these fractions. These results show that ClO_2 bleaching is preferable to hyprochlorite bleaching, as it causes less degradation of cellulose. 8 ref. J.S.

8978. KAYAMA, Tsutomu. **Chemical studies on decayed wood as a raw material for pulp. 5. Progressive changes in degree of polymerization of decayed wood cellulose and effect of decay on degree of polymerization and crystalline region of pulp from decayed wood.** J. Japan Wood Res. Soc. 8, no. 5: 197-203 (Oct., 1962). [Jap.; Engl. sum.]

The chem. changes of wood cellulose during decay and the relation between qualities of decayed wood cellulose and of the resultant pulps were investigated by detg. the D.P. and the cryst. region. The samples were trd. with the nitration mixts. of Alexander and Mitchell. The D.P. of the nitrate deriv. was detd. viscometrically. The cryst. region was detd. by acid hydrolysis. During all stages of decay by white-rot fungi, the D.P. of decayed wood cellulose decreased somewhat and its fine structure changed only slightly from that of sound cellulose. In brown-rotted wood, however, the D.P. of cellulose decreased rapidly, and its fine structure was significantly affected. These charact. of decayed wood cellulose affected the qualities of the resultant pulps. 14 ref. C.L.B.

3389. *KAMIYA, T., and NOGUCHI, A. **Investigations on the control of the degree of polymerization in the production of cellulose acetate flakes.** Chem. High Polymers Japan 19, no. 206: 333-6 (1962); Makromol. Chem. 56: 243 (Oct., 1962).

In the mfr. of CA flakes by pretrmt., acetylation, and hydrolysis of cellulose, maintaining the D.P. const. is one of the most important problems. Studies conducted to det. the relationships between the D.P. and processing conditions in each of the 3 mfg. stages are described, and anal. methods for the detn. of the D.P. are discussed. Results indicate that the D.P. of CA flakes is easily regulatable during the hydrolysis process, and that the D.P. increases by 10-15 units if the water content in the hydrolysis bath is increased from 10 to 15%. C.L.B.

982. ZHIGACH, K. F., FINKEL'SHTEĬN, M. Z., TIMOKHIN, I. M., and MALININA, A. I. **The effect of temperature on the viscosity and the degree of polymerization of aqueous solutions of carboxymethylcelluloses.** Kolloid. Zh. 24, no. 2: 162-7 (March/April, 1962). [Russ.; Engl. sum.]

The mechanism of irreversible viscy. redn. of CMC, caused by heating of aq. solns., was investigated. Six CMC prepns. (D.P. ranging from 164 to 517, D.S. from 80.4 to 165) were used in the study. The temp. coeffs. of viscy. were high for all CMC prepns. and increased with the D.P. The irreversible redn. of viscy. caused by heating to 80-100°C. also increased with the D.P. Thus, for a D.P. of 164, 257, and 517, the irreversible viscy. redn. after heating for 1 hr. at 100° was 6.1, 12.9, and 20.4%, resp. At this temp., the redn. of D.P. was insignificant; 5 hr. heating at 100° reduced the initial D.P. of 257 to 242. Heating at higher temps. (130 and 150°) was accompanied by considerable degradation of CMC. The D.S. of CMC had rel. little effect on the irreversible redn. of viscy., although a high D.S. tended to increase the resistance of the solns. to heating. The effect of heating on viscy. was more marked at higher (1%) than at lower (0.25%) concn. of the soln., and also more marked for the gel-forming than for the sol-forming fraction of CMC. The irreversible redn. of viscy. cannot be explained by the degradation of the macromols., as assumed by some workers. More probably, it is caused by dispersion of aggregates during heating and subsequent stabilization of the dispersed state by the low-mol. fractions. Evidence for such a mechanism can be found in the bond energies of CMC prepns. calcd. from an equation expressing the sp. viscy. as an exponential function of the bond energy and abs. temp. 16 ref. J.S.

3759. Hosoi, Hayao, Nomura, Yoshika, and Migita, Nobuhiko. **Researches on the swelling of fibers. 7. Relation between several swelling factors and the swellability of fibers.** J. Jap. Tappi 16, no. 2: 102-8 (Feb., 1962). [Jap.; Engl. sum.]

Fiber swelling abilities were detd. quant. by a newly proposed method on 9 kinds of fibers, viz., chlorite holocellulose trd. with 0.08% NaOH soln., and the same freeze-dried with alc./dry ice, UV-irradiated, and/or extd. with 6% NaOH soln. in various combinations. The results showed that the condition of the outer fiber layer, the amt. of hemicellulose, and the D.P. of the cellulose are important for fiber swelling. 3 ref. C.L.B.

7197. Mašura, Vlado J. **Concerning polymolecularity of the short fiber component of pulp.** Faserforsch. Textiltech. 14, no. 12: 527–30 (Dec., 1963). [Ger.; Russ. & Engl. sum.]

Studies of the polymolecularity of the short and long fiber content of a sulfate pulp and two different spruce sulfite pulps show that the integral distribution curve of the short fiber component of a given pulp is shifted to a region of lower D.P. and indicates a greater amt. of low mol. wt. substance than that of the long fiber component. However, whereas the short fiber content of a pulp is detd. by both the raw matl. and processing conditions employed in pulp mfr., the amt. of low mol. wt. substance is detd. only by the processing conditions. It is further shown that with decreasing fiber length, pulp viscy., D.P., and α-cellulose content decrease, while copper no. increases. 6 ref. L.G.S.

63. Mašura, Vlado J. **On the influence of defibration on the heterogeneity of alkali cellulose.** Svensk Papperstid. 66, no. 10: 394-402 (May 31, 1963). [Ger.; Swed. & Engl. sum.]

Shredding of alkali cellulose in a Werner-Pfleiderer sigma-blade shredder at low speed and in an Eirich shredder at high speed was exaind. by mech. fractionation of the regenerated alkali celluloses into seven fractions. The shredding was carried out on a lab. scale, as well as full ind. scale. It was established that the mol. nonuniformity of the alkali cellulose increased by shredding it into "crumbs" and "dust" in these machines. The dust has a lower viscy. and D.P. than the crumbs, whether the shredding is done before or after ageing of the alkali cellulose. These two alkali cellulose components also differed with respect to polymolecularity. The dust has a higher content of low-mol. components, and its entire chain-length distribution curve runs within a region of lower D.P. Furthermore, it appeared that the alkali cellulose in the crumbs was nonuniformly degraded and that the distribution curve of this fraction had a tail effect, which means that a certain fraction of pract. undegraded chains existed. The dust fraction obtained from a mixt. of birch sulfate and spruce sulfite pulps showed higher viscy. than the crumbs after ageing to the same D.P. value. This depends predominantly on the fact that the dominating part of the dust consists of birch sulfate cellulose, which has a lesser rate of degradation than alkali cellulose from spruce sulfite pulp. Further, it appeared that a shredder of the Werner-Pfleiderer or Eirich type is not the best possible alternative for the mfr. of a uniform alkali cellulose for staple, rayon, or cord. By shredding alkali cellulose in a shredder which works according to the same principle as a hydrapulper, it was possible to obtain an alkali cellulose shaped like "down." The polydispersity curve showed no undegraded components, i.e., no tail effect, although the alkali cellulose had been degraded to a higher viscy. value. 6 ref. C.L.B.

7200. Neal, J. L. **The influence of cooking on the D.P. distribution of wood pulp.** Proc. Can. Wood Chem. Symp. 1: 18–25; discn.: 26 (Sept., 1963).

Some insight into the D.P. distribution of various cooked pulps was obtained, but no clear answer to the question which pulping process produces the sharpest (narrowest) distribution. 14 ref. C.L.B.

5308. Stockman, Lennart, and Teder, Ants. **The effect of drying on the properties of papermaking pulps. 2. The effect of heat-treatment on the mechanical properties.** Svensk Papperstid. 66, no. 20: 822-32 (Oct. 31, 1963). [Engl.; Swed. & Ger. sum.] *cf.* A.B.I.P.C. 34: abstr. 3587.

Heat trmt. during ind. pulp drying is one of the causes of the differences between the props. of dried and undried pulps used as raw matl. in the pmkg. process. As a rule it is the intensity and duration of the heat trmt. that makes the difference between the different pulp-drying processes used industrially. The thermal sensitivity of various pulps with different dry contents (held const. during the expts.) was investigated in the temp. range of 70-200°C. The expts. were carried out by heating pulp sheets packed air-tight in aluminum foil and by blowing steam through shredded pulp. The defibratability of the unbleached sulfite pulp was considerably decreased by trmt. at 90°, whereas the unbleached sulfate pulp was unaffected. The beating required to obtain a certain breaking length was increased by heat trmt., whereas the beating required to obtain a certain °S.-R. was, as a rule, unaffected. At moderate temps. (below 140°), the tear factor was increased and the breaking length decreased when the comparison was made after heating to a certain °S.-R. The tear factor at const. breaking length was decreased by heat trmt. of wet bleached pulps, but the effect was less, and sometimes even opposite, for the dried and partly dried pulps. The unbleached pulps were considerably less affected than the bleached pulps. The bleached sulfate pulp was esp. sensitive to temps. exceeding 140°. The decrease in strength is probably caused by the decrease in D.P. during heat trmt. below the value crit. for the strength props. The bleached sulfite pulp was much less affected. 17 ref. C.L.B.

7168. BATES, Norman A., and LYNESS, W. I. **The effect of drying from ammonia-water mixtures on paper properties.** Tappi 48, no. 2: 72-9 (Feb., 1965).

When paper was soaked in aq. NH_3 solns. of increasing concn. and dried, breaking length increased from 2000 m. to a max. of 5000 m. for 90-95% NH_3. Other changes included an increase in wet breaking length and changes in x-ray crysty. expected from penetration of the ordered regions. Changes in D.P., hemicellulose content, and N content of the paper were very small. The strength increase was maintained when the 90% NH_3 was washed out with water before drying. Trmt. of pulp with aq. NH_3 prior to sheet formation, however, resulted in handsheets of reduced strength. The need for a preformed web was emphasized by the observation that the strength of the trd. paper is directly related to the strength of the web before soaking in 90% NH_3. The rate at which the paper was immersed was an important variable, apparently because a slow dipping rate led to partition of the ammonia-water soln. as liquid migrated into the paper ahead of the solvent front. Variations in dipping rate also affected the results with anhyd. NH_3, possibly because a strong contraction occurs when paper is wetted with high NH_3 concns. Variations in soaking liquid and pulp source also influenced the results. Large strength increases were obtained only with low-mol.wt. or difunctional amines that penetrate the ordered regions. The magnitude of the strength response decreased with increasing alkyl substitution. A limited study of different bleached dry lap pulps indicated that kraft gave larger dry tensile increases than did sulfite or linters. The nature of the wet strength devd. on dipping in 90% NH_3 has not been elucidated. It appears to be present while the paper is wet with aq. NH_3 and is the same before and after drying from water. The data are not consistent with entanglement, interdiffusion of swollen surfaces, or chem. crosslinking as the source of wet strength. 11 ref.

C.L.B.

1833. BINGHAM, B. E. M. **A study of the fine structure of regenerated cellulose fibers.** Makromol. Chem. 77: 139-52 (Aug. 17, 1964). [Engl.; Ger. sum.]

Studies concerning the fine structure of a ser. of regenerated cellulose fibers having a high wet modulus show that while the birefringences, leveling-off D.P., and accessibilities of the various fibers varied widely, there was only a slight variation in the x-ray crysty. of the various fibers. Indications are that birefringence, leveling-off D.P., and accessibility detns. measure the overall fiber orientation in both the cryst. and amorphous portions rather than the amt. of truly cryst. matl. Further, the x-ray crysty. of regenerated cellulose fibers was not affected by conditions of spinning, cellulose D.P., or viscose cpn. Rather, it is suggested that the x-ray crysty. is detd. by the probability of cellulose mols. in soln. taking up positions of preferred 3-dimensional orientation with respect to one another before their mobility is essentially fixed by coagulation and regeneration. 15 ref.

L.G.S.

1097. CHOCHIEVA, M. M., BRESTKIN, Yu. V., and NIKITIN, N. I. **The fractional composition of native cellulose and kraft pulps from larchwood.** Zh. Prikl. Khim. 36, no. 7: 1566-71 (July, 1963). [Russ.]

The nitration method was appl. to the study of D.P. distribution of "native" larchwood cellulose and kraft pulps from larchwood. The "native" cellulose was prepd. by nitration of extd. wood (from a single tree or pooled from 10 trees) under mild conditions. Distribution curves (integral and differential) are given for the two native celluloses and for 4 unbleached kraft pulps, obtained in cooks without prehydrolysis and with prehydrolysis at 150°C. (under conditions of slow and rapid temp. rise). The delignification conditions were the same for all pulps (2 hr. cooking at 173°). Native larchwood cellulose had an av. D.P. of 3600, and 75% of its mols. had a D.P. within the 2500-4500 range. The distribution curve of cellulose from the pooled wood had two peaks within the main D.P. range, while cellulose from a single tree had only one higher peak. The distribution curves of kraft pulps show that the D.P. of cellulose decreases with the harshness of delignification conditions. For example, an increase of alkali concn. and sulfidity of the cooking liquor reduced the av. D.P., and the high-mol. fraction, and increased the content of fractions with low D.P. Prehydrolysis decreased the av. D.P. of pulps, its content of low-mol. (D.P. below 200) fractions, and its content of high-mol. (D.P. over 1200) fractions. Depending on the delignification conditions, the av. D.P. of pulps ranged from 2010 to 924. 5 ref.

J.S.

1098. CHOCHIEVA, M. M., BRESTKIN, Yu. V., and NIKITIN, N. I. **The fractional composition of sulfite pulps from larchwood.** Zh. Prikl. Khim. 36, no. 9: 2055-60 (Sept., 1963). [Russ.]

The fractional cpn. of sulfite pulps from larchwood (*Larix dahurica*) was studied as a function of the conditions of delignification and bleaching. The pulps were prepd. by NH_3-base pulping process with a liquor contg. 7.5% SO_2 and 0.914% $(NH_4)O$. The max. cooking temp. was 140°C., and the cooking time at the max. temp. 1 hr. (sample A) or 3 hr. (sample B). A third pulp (sample V) was prepd. by rapid (45 min.) high-temp. (145°) delignification with a 15% soln. of SO_2 in a 1:1 mixt. of water and alc. Fractionation of the pulps was carried out by the nitration method. The D.P. distribution curves of native larchwood cellulose and of the pulps showed that pulping affects strongly both the av. D.P. and the fractional cpn. Gen., pulping resulted in a "flattening" of the distribution curves, by eliminating the sharp peaks observed in curves of native cellulose, and increasing the content of low-mol. fractions. The effect was the least marked [illegible]

and the most marked for pulp V. All pulps, however, had a high content (over 50% and up to 66%) of high-mol. fraction (D.P. from 1200 to 3500 and even higher). The A and B pulps and also a larchwood kraft pulp, the fractional cpn. of which has been reported earlier (*cf.* A.B.I.P.C. 35: abstr. 1097), were bleached by a five-stage process (chlorination, alkali trmt., two hypochlorite bleaching stages, and trmt. with aq. SO_2). The hypochlorite bleaching time was 3.5 hr. for pulp A and less than 2 hr. (100 min.) for pulp B. The kraft pulp was bleached with a high concn. of hypochlorite (3.6%). In pulp B, bleaching caused a marked redn. of pentosan content, complete elimination of lignin, but also an increase of uronic acids content. Changes were less drastic in the case of pulp A, esp. the redn. of the av. D.P. The highest redn. of the av. D.P. was observed for kraft pulp, accompanied by an accumulation of low-mol. fractions (nearly 50% of mols. with a D.P. 200-600). Despite the rel. high degradation, sulfite bleached pulps had a high (about 50%) content of high-mol. fractions, and all three pulps had a high α-cellulose content (94%, on the av.). 6 ref. J.S.

1099. CHOCHIEVA, M. M., VISHNEVSKAYA, N. S., and NIKITIN, N. I. **The fractional composition of bleached hardwood pulp.** Zh. Prikl. Khim. 36, no. 10: 2276-81 (Oct., 1963). [Russ.]

The effect of the conditions of alkali trmt. during the bleaching process on the chem. and fractional cpn. of aspenwood (*Populus tremula*) prehydrolysis kraft pulps was investigated. The pulps were bleached by a five-stage process (chlorination, alkali trmt., hypochlorite bleaching, washing with alkali, bleaching with ClO_2, second hypochlorite bleaching, and trmt. with aq. SO_2). Three samples of bleached pulp were prepd.: sample A, not subjected to alkali trmt.; sample B trd. with 2% NaOH at 95°C.; and sample V, trd. with 10% NaOH at room temp. Pulp A was charactd. by a high degree of purity: it contained 96.7% α-cellulose, and only 2.5% pentosans. Trmt. with 2% NaOH at 95° (pulp B) only slightly reduced the pentosan content and increased the α-cellulose content (to 2.3 and 97%, resp.). Bleached pulp V had an α-cellulose content of 97.9%, a pentosan content of 2%, and low contents of β- and γ-cellulose (0.2 and 0.4%, resp.). The D.P. distribution curves of the pulps showed that pulp V has no peaks at any D.P. interval, while in pulps A and B, fractions of D.P. over 1200 constituted about 68%. All pulps had a content of low-mol. fractions (D.P. less than 200) not exceeding 4%. 15 ref. J.S.

4638. IEJU, Geza. **Tensile strength behavior as a function of cellulose in wood.** Forest Prod. J. 14, no. 8: 366-72 (Aug., 1964).

Random depolymerization of the cellulose fraction of Douglas-fir (*Pseudotsuga menziesii*) wood by means of various dosages of γ-irradiation was used to study the influence of cellulose chain length on the mechanical behavior of wood under tension parallel to the grain. Data indicate that tensile strength props. of latewood are not only distinctly higher than those of earlywood, but also the response of the two growth zones to changes in cellulose D.P., moisture content, and temp. are different. A decrease in the cellulose D.P. reduces strength and ultimate strain more in the low than in the high D.P. regions. Elastic props. in tension are affected little by the random depolymerization of cellulose. The tensile strength charact. of wood with degraded cellulose are more sensitive to changes in moisture content than is wood with long-chain cellulose. 18 ref. W.W.

5307. MININA, V. S., SUSHKEVICH, T. I., and AGAMALOVA, V. G. **A study of the polydispersity and of the hydrolysis rate of cellulose from cotton plant stems.** Khim. i Fiz.-Khim. Prirodn. i Sintetich. Polimerov, Akad. Nauk Uz. SSR, Inst. Khim. Polimerov no. 2: 104-9 (1964). [Russ.]

Cellulose was isolated from cotton stems by trmt. with 3.5% HNO_3, heating the insol. residue with 2% NaOH and Na_2SO_3, washing, and drying at 60°C. The cellulose contained 1.5% lignin and 2% hemicelluloses. It was fractionated by nitration and pptn. with petroleum ether from Me_2CO solns. The cellulose contained 36.5% of the low-mol. fraction (D.P. up to 200), and 26.5% of the high-mol. fraction (D.P. of over 1200). Its av. D.P. was 913. Hydrolysis of the cellulose prepn. was carried out with 10% H_2SO_4 at the boiling temp. under normal pressure with a liquor ratio of 1:40. During the first 1.5 hr., the reaction const. was 0.0880, and the D.P. decreased to 281. This period corresponded to the hydrolysis of the easily hydrolyzed fraction, which constituted 12.1% of the cellulose (as compared with 2% and 2.84% for cotton cellulose and sulfite pulp, resp.). The remaining fraction was hydrolyzed at a low rate (reaction const. 0.0390-0.0224) with gradual redn. of the av. D.P. After 6 hr., the D.P. reached a const. value of 170. This residue contained 86.5% low-mol. fraction, and only 3.5% of a fraction with D.P. 300-400. This shows that during hydrolysis, degradation involves primarily macromols. with high D.P. This fact, and the high content of easily hydrolyzed fraction, must be taken into consideration in ind. hydrolysis of cotton stem l.c. 11 ref. J.S.

4364. OLTUS, Eugen, and ELIAŠOVÁ, Darina. **Study of the properties of decrystallized cellulose.** Sb. Výskum. Prác Odboru Celulózy Papiera no. 8: 35-51 (1963). [Slovak.; Russ., Ger., & Engl. sum.]

Cotton, a dissolving sulfite pulp, and a prehydrolysis kraft pulp, the latter two refined to contain 96% α-cellulose, were decrystd. with ethylenediamine and with NaOH, in concns. ranging from 31.4 to 82.3% and from 5 to 25%, resp., using the previously described method (*cf.* A.B.I.P.C. 32: abstr. 8101). The decrystd. pulps were tested for their cryst. fraction, av. D.P. (by viscometry), the av. length of crystallites, the soly. in H_3PO_4, and the zero-span breaking length. The highest decrystg. effect of ethylenediamine was observed on the sulfite pulp, while the highest decrystn. of the kraft pulp was obtained by NaOH. Curves obtained by plotting the av. D.P. as a function of cryst.

had minima: with NaOH, the min. D.P. for cotton cellulose was at a crysty. of 84%, for the wood celluloses at 80%; with ethylenediamine it was at a crysty. of 91% for all three celluloses. Similar curves for soly. in H_3PO_4 showed corresponding maxima. The av. length of crystallites (calcd. from av. D.P. flg. ethanolysis) decreased with crysty., but had a tendency to reach a const. value. The min. values on the crysty./D.P. curves cannot be interpreted simply. The phenomenon may be due to inactivation of the OH groups of cellulose under the influence of decrystn. or, it may indicate a direct splitting of chem. bonds. On the other hand, the limiting value of the crystallite length can be explained by their splitting in both the transversal and the longitudinal direction. Decrystn. affects the tensile strength of the fibers. The zero-span breaking length depends on the av. length of crystallites, but only up to a definite value of this length. By such measurements, the pulps can easily be distinguished: thus, at the same av. crystallite length, the difference in the breaking length of the three celluloses is about 2000 m. (cotton having the highest, sulfite pulp the lowest value). This suggests differences in the submicroscopic structure of the crystallites themselves, and is confirmed by x-ray diffraction studies. A gen. conclusion from the study is that the pulps contain a mesomorphous fraction, which can play an important role in detg. the phys. and chem. props., and be itself affected by the structure of the crystallites. 6 ref. J.S.

ABIPC Vol. 36

7020. Chiddix, M. E., Duncan, J. J., Fredericks, R. J., Glickman, S. A., and Hecht, O. F. **Vinylated cotton. (2) Preliminary examination of physical and textile properties.** Textile Res. J. 35, no. 11: 965-72 (Nov., 1965); *cf.* A.B.I.P.C. 36: abstr. 6244.

Samples of vinylated cotton slivers with D.S. values of about 0.05 and below were found to be sol. in cuene hydroxide soln. Viscy. detns. indicated D.P. values ranging from 97 to 586 which were considerably lower than that of the starting cotton (D.P. about 3000). Samples with higher D.S. values were insol. in the reagent indicating a small amt. of cross-linking. X-ray diffraction patterns made from the vinylated cotton slivers and fabric showed nearly complete loss of cellulose crysty. at D.S. values above 0.10. This indicates good penetration of the cryst. regions by the catalyst and acetylene in the vinylation reaction. Good crease recovery angles were obtained by heating vinylated cotton fabric (D.S. 0.21) with acidic catalysts. Most samples had breaking strength measurements 55-85% of the control fabric and showed 20-50% elongation at break. 6 ref. W.W.

4121. Jayme, Georg, and Krause, Thomas. **Statistically significant relationships between the chemical composition and the strength properties of poplar sulfite pulps.** Papier 19, no. 7: 330-6 (July, 1965). [Ger.; Engl. & Fr. sum.]

Pulps from 25 different poplar spp. were produced by a mild standardized Ca bisulfite process involving a digestion at 120°C. These pulps were tested for breaking length, burst, folding endurance, and tear. Each of these strength values (in the entire ser.) was expressed as a function of the resp. alpha-cellulose (*I*) and lignin (*II*) contents, the D.P., the water retention value (WRV), and the pulp yield. The statist. correlation factor was detd. for each individual pair of values. WRV's showed trends similar to those of the strength data. The *I* and *II* contents gave statist. evidence of affecting (lowering) the strength props. Similar studies dealing with possible correlations between specific wood props. and pulp strength showed that tensionwood causes a marked redn. in all the usual strength props. of the resp. sulfite pulps. Long fibers have a favorable influence on tear resistance, although the latter is also influenced by some other factors, because the av. fiber lengths of the various spp. varied only slightly. This extensive study reaffirms the fact that strength devt. in pulps depends mainly on chem., colloidal, and morphol. factors, and these may actually be superimposed on each other. A math. approach to the factors that det. strength props. of pulps made from various wood samples of a given sp. seems feasible, provided reproducible data and good statist. evalns. are used. 22 ref.

6251. (U) Lewandowski, Stefan. **Chemical properties of polynosic fibers.** Techn. Włókienn. 13, no. 8: 223-7 (1964). [Pol.]

A comparative study of a large no. of samples of polynosic fibers (both domestic and foreign) showed the flg.: the D.P. of cellulose is higher in polynosic than in conventional viscose rayon fibers; the swelling capacity of polynosic fibers in water is close to that of cotton fibers, and much lower than that of ordinary rayon fibers (such as Textra and Meron); polynosic fibers dissolve in mineral acids with more difficulty, and are more resistant to the action of alkali; complex solvents, however, dissolve polynosic fibers better than other regenerated cellulose fibers; there is no correlation between the soly. and the D.P. of polynosic fibers. *From* Ref. Zh., Khim. no. 16: abstr. S 694 (Aug. 25, 1965). J.S.

3338. Mašura, Vlado. **Homogenization of the polymolecularity of kraft pulps during chlorination and hydrolysis.** Chem. Průmysl 14, no. 5: 254-8 (May, 1964). [Slovak.]

The effects of chlorination and HNO_3-hydrolysis on the viscy., av. D.P., α-cellulose content, and D.P. distribution of unbleached prehydrolysis kraft pulps from poplar and aspen, were investigated. Chlorination caused a redn. of α-cellulose content, viscy., and av. D.P. in proportion to the amt. of active

Cl used (up to 400%, based on Küng's no.), but the rate of viscy. drop was higher than that of av. D.P. redn. as a result of preferential degradation of high-mol.-wt. chains. The chlorinated pulps had not only a lower av. D.P., but also were "homogenized" with respect to D.P. distribution, i.e., had low contents of high- and low-mol.-wt. fractions. The same results were obtained when the pulps were chlorinated in two stages with smaller amts. of Cl. Trmt. of the pulps with ClO_2 caused a slow redn. of viscy. and an insignificant redn. of the av. D.P. On the other hand, the hydrolytic and oxidative action of HNO_3 (either in dild. solns. or 2V) had an effect similar to chlorination. The homogenization of pulps by hydrolysis with hot dild. HNO_3 resulted in a D.P. distribution similar to that obtained by aging alkali cellulose. The hydrolyzed pulps could be used for a one-stage viscose process, without alkali trmt., pressing, and aging. 7 ref. J.S.

ABIPC Vol. 37

8044. Lange, K. H. THE INFLUENCE OF CHLORITE BLEACHING ON THE D.P. OF COTTON. Textilveredlung 1, no. 6: 295-8 (June, 1966). [Ger.]

Studies are presented which show that under normal conditions, chlorite bleaching does not involve degradation of cellulose fibers. However, excessive chlorite concns., especially when in combination with high temps. (100 or 105°C.), can result in considerable fiber degradation (redn. in D.P.). This redn. in D.P. is particularly marked when no activator has been added to the bleaching bath. Alkali addns. accelerate fiber degradation. Chlorite residues in bleached fabrics, resulting from improper washing, can cause fiber degradation, even when these residues are as low as 0.05-0.07%. 10 ref. L.G.S.

5665. Safonova, V. V.; Klenkova, N. I. CHANGES OF THE DEGREE OF POLYMERIZATION, MECHANICAL PROPERTIES, AND INTERNAL SURFACE AREA OF CELLULOSE FIBERS [UNDER THE INFLUENCE OF ULTRASOUND]. Zh. Prikl. Khim. 39, no. 7: 1560-5 (July, 1966). [Russ.]

Samples of sulfite dissolving pulp were irradiated with ultrasonic waves (frequency 440 kc./sec.) in an aq. medium with and without mixing, and in a gaseous medium (O or Ar). Microscopic exams. of the irradiated fibers showed morphological changes, consisting in bending of the fibers (which in many instances became sinuous in shape) and degradation of the cell wall, the latter more pronounced in gaseous media. At all fiber concns. used, there was a drop in viscy. to a limit level, attained at about 4 hr. irradiation. The drop corresponded to redn. of D.P. from 1290 to 1070. There was also some breaking of the fibers and some dissolution (the losses of fibers not exceeding 4%). The soly. in cadoxene was better than that of untrd. fibers. Irradiation without mixing had little effect on the mech. strength of the fibers. Irradiation with mixing increased considerably the breaking length. Irradiation gen. increased the internal surface area of the fibers; however, the effect of ultrasound on the surface area depended on the preliminary trmt. of the fibers as well as on their nature. Thus, the effect was less marked on cotton fibers than on wood fibers. There was a significant increase of the surface area flg. irradiation in aq. medium, but not when irradiation was carried out in org. solvents, such as MeOH, Me_2CO, or heptane. The effects on the fiber morphology and the disruption of cell walls can be explained by stretching and compression forces acting simult. on the two ends of the fibers, by the action of alternating pressure, and cavitation. The latter explains a higher degree of degradation in gaseous media. The increase of the fiber mech. strength can be attributed to the formation of a large no. of interfiber bonds, due to interweaving of the fibers and their partial fibrillation. Mixing of the suspension causes changes in the ultrasonic field and reduces cavitation, and for this reason irradiation without mixing (with standing waves) has, gen., a stronger effect. 10 ref. J.S.

4919. Yashunskaya, A. G.; Konovalova, E. M.; Shulyatikova, N. V. EFFECT OF LOW MOLECULAR FRACTIONS ON THE PROPERTIES OF HIGH-TENACITY RAYON CORD. Khim. Volokna no. 3: 35-9 (1966). [Russ.]

Low-mol. fractions of alkali celluloses (D.P. less than 200) were added in amts. of 10, 20, and 30% to samples of alkali celluloses obtained from prehydrolysis kraft pulps (all alkali cellulose samples had an av. D.P. of 480-500). The initial alkali cellulose and alkali celluloses to which low-mol. fractions were added, were anald. for their contents of α-, β-, and γ-cellulose, were converted into viscoses, and the viscoses spun into fibers. With increasing content of low-mol. fraction, there was an increase in the salt no. of viscoses and, at equal salt nos., an increase of the D.S. of CX (this was caused by a higher D.S. of the low-mol. fractions and an unfavorable distribution of the xanthate groups). Fibers spun from viscoses contg. low-mol. fractions had a thinner skin, higher swelling capacity in water, and a lower fatigue resistance. Also, their wet strength was lower. The redn. of the mech. strength of the fibers with increasing content of low-mol. fractions

ABIPC Vol. 38

8123. Morgan, N. A.

USE OF DEGREE OF POLYMERIZATION TESTING IN EUCALYPT PULP BLEACHING INVESTIGATIONS.

Appita 21, no. 2: 51-9 (Sept. 1967).

A study was made of the relationship between D.P. of bleached eucalypt kraft pulp and their respective strength and beating props. During the bleaching operation, the D.P. could be reduced from an unbleached pulp D.P. range of 1,500-1,800 down to 1,000, before there was any significant redn. in strength props. Tear resistance is inclined to drop at a slightly higher D.P. than do the other strength props. The D.P. of bleached pulp is influenced by the D.P. of the unbleached sample, by the actual bleaching conditions, and also by the final pulp brightness. The initial (i.e., unbleached) D.P. is itself influenced by wood species, wood quality, and by the cooking conditions used in pulping. D.P. serves as a useful tool in comparing bleached pulps prepd. by various methods in the lab. In the bleach plant, the D.P. tests are of service in "trouble-shooting" and in process and quality control. 4 ref. L.E.W.

7382. Teppich, G.

TENSILE STRENGTH AND D.P.

Textilveredlung 2, no. 10: 774-5 (Oct., 1967). [Ger.]

Data are presented describing the relationship between redn. in cellulose D.P. of a cotton fabric as a result of bleaching or other trmt. and fabric tensile strength. Data show that while redn. in D.P. gen. means some loss in tensile strength, the relationship is by no means linear. Changes in tensile strength resulting from redn. in D.P. in the range 2500-1000 are often rel. minor. Redn. in D.P. below 1000 effects more marked tensile strength redns. 4 ref. L.G.S.

ABIPC Vol. 39

7577. Latour, H.

DETERMINATION OF THE DEGREE OF POLYMERIZATION AS A METHOD OF ESTIMATING THE RESISTANCE TO AGING OF ELECTRIC INSULATION PAPERS.

Prace Inst. Elektrotech. 13, no. 44: 31-47 (1965). [Pol.]

The lab. methods used for the detn. of paper aging were found, as a rule, unsuitable for testing elec. insulation papers which underwent deterioration during exploitation. In recent yr., a method based on the detn. of DP aroused the interest of concerned labs. The author discusses the gen. structure of cellulose and the processes taking place during aging of insulation papers, and gives a detailed description of the principle and procedures for the viscometric detn. of DP, incl. the selection of the solvent and the app. used. The viscometric method, based on Fr. std. NF-T 12-003, was used to det. the DP of several insulation papers (domestic Pol. and imported). In this method, cuene is used as the solvent, and measurements are made in an Ubbelohde viscometer. Simult., the paper samples were tested for their mech. strength after accelerated aging at 140 C. The DP and tensile strength curves showed considerable differences. The initial rapid redn. of DP corresponded to a slight redn. of tensile strength. In later stages, when the DP values tended to become stabilized, small changes in DP corresponded to considerable changes in tensile trength. The redn. of DP at which a decrease of tensile strength was observed depended on the nature of the paper, and ranged from 70 to 50% of the initial DP. Thus, the DP method makes it possible to det. early-stage deterioration. The small samples needed (0.05-0.1 g.) can be easily collected from transformers 13 ref. J.S.

4636. Siclari, F.

POLYNOSIC FIBERS FROM DIFFERENT TYPES OF DISSOLVING PULPS.

Pure Appl. Chem. 14, no. 3/4: 423-33 (1967). [Engl.]

Polynosic fibers were prepd. from the flg. dissolving pulps: a prehydrolyzed sulfate pulp, hardwood sulfite pulps with low and high gamma-cellulose/beta-cellulose ratios, fir sulfite pulps with low and high viscosities, and a fir rayon-grade dissolving pulp. It is shown that the charac. of the polynosic fibers are related to the props. of the starting pulps. Chem. props. of the pulp samples and the props. and performance of the fibers prepd. from the various pulps are given. The av. DP of the fibers decreased with increasing polydispersity of the starting pulp. As the fiber DP decreased, the tenacity and breaking length decreased and the soly. in 5% NaOH increased. The wet tenacity of the fibers decreased with increasing soly. of the starting pulp in 7.14% NaOH, with increasing polydispersity of the starting pulp, with increasing aberrant sugar content of the starting pulp, and with the increasing difference between undissolved residue in the starting pulp in 18 and 10% NaOH. Fabrics woven from the polynosic fibers have dimensional stability comparable to cotton fabrics. W.W.

7546. Solechnik, N. Ya.; Natkina, L. N.; Likhacheva, L. I.
EFFECT OF THE POLYDISPERSITY OF THE CELLULOSE FRACTION OF THE MOLDING MATERIAL ON THE PROPERTIES OF BINDERLESS MOLDED WOOD PRODUCTS.
Lesnoi Zh. 11, no. 4: 106-9 (1968). [Russ.]

In plastic-like prods. obtained from milled and partially hydrolyzed wood, the filler content (i.e., the content of wood) is 75-80%. It can be assumed that the props. of the molded binderless prods. are detd. by the processing method, the nature of the wood, and the state of the main wood component – cellulose. To study this problem, birchwood sawdust (a.d.), and sawdust hydrolyzed for 30 min.-3 hr. at 150-190 C., were molded at 150 C. and a pressure of 150 kg./sq.cm. The initial wood samples and the molded prods. were extd. with hot water and EtOH/benzene, and holocelluloses were sepd. from the extd. samples. The holocelluloses were dissolved in cadoxene and fractionated by pptn. with aq. glycerol. For each cellulose fraction, detns. were made of mol.wts. and DP (from viscy. measurements). Over 20 holocellulose prepns. were isolated and anald. The fractional cpn. and mol.wts. of celluloses underwent considerable changes during hydrolysis (with satd. steam). The DP and mol.wt. values were inversely related to the temp. and time of hydrolysis. There was a redn. of the cellulose DP during hot pressing, but it was smaller than during hydrolysis. The highest DP of the individual fractions of cellulose were observed when hydrolysis was carried out for 30 min. at 190 C. These DP values were in the range of pmkg. pulps. The molded prods. obtained from matls. hydrolyzed under the above conditions (and also 3 hr. at 170 C.) had the highest mech. strength. Thus, the optimum DP of cellulose in hydrolyzed wood is 1000-700, and the corresp. optimum mol.wt. 140,000-100,000. The static bending strength of the molded prods. obtained under optimum conditions of hydrolysis, was 600-700 kg./sq.cm. J.S.

ABIPC Vol. 40

5772. Kapustova, J.; Eliasova, D.
EFFECT OF HYDROLYSIS AND COOKING CONDITIONS ON SOME PULP PROPERTIES.
Sb. Vyskum. Prac Odboru Papiera Celulozy 13: 33-41 (1968). [Slovak.; Russ., Ger., & Engl. sum.]

Four series of prehydrolysis kraft cooks of beechwood were carried out. In the first two series the cooking conditions were kept const. (16% NaOH, sulfidity 22-28%, max. temp. 160 C., cooking time 90 min.), and aq. prehydrolysis was carried out for 0-150 min. at a temp. of 160 and 170 C., resp. In the two last series, the prehydrolysis conditions were kept const. at 170 C. and 60 min., while the cooking time was varied from 0 to 150 min., and the temp. max. was 160 and 170 C., resp. For all pulps, detns. were made of the av. DP, polydispersity, crysty., av. crystallite length, and reactivity. As compared with high-quality dissolving pulps (sulfite pulps from beechwood and sprucewood, pinewood prehydrolysis kraft pulp), the lab.-prepd. beechwood pulps had a lower crysty. (88.3-93.5%), while their av. DP (614-1350) and crystallite length (417-865 A.) were gen. higher. Higher temp. and longer time during prehydrolysis or the cooks caused a redn. of the av. DP and an increase of reactivity. Prolonged cooks increased the homogeneity of the pulps, but at the max. cooking time caused degradation of long macromol. chains and increased the content of fractions with DP of up to 200. The av. DP was affected more by prehydrolysis conditions, while crysty. was affected both by prehydrolysis and cooking conditions. 14 ref. J.S.

1866. Pandey, S. N.; Iyengar, R. L. N.
CHEMICALLY MODIFIED COTTON. I. EFFECT OF CHEMICAL TREATMENTS FOR VARYING PERIODS ON CRYSTALLINITY AND CERTAIN OTHER PROPERTIES OF COTTON.
Textile Res. J. 39, no. 1: 15-23 (Jan., 1969).

Cotton from *Gossypium arboreum* and *G. hirsutum* was trd. with anhyd. ethylamine, diethylamine, pyridine, and 30% NaOH and 40% KOH for varying periods of time. Crysty. was decreased appreciably on trmt. with anhyd. ethylamine. Fiber bundle strength at zero and 3 mm. gage lengths, stiffness, DP, and birefringence decreased, while elongation and toughness increased. Ethylamine also produced considerable swelling of the cotton fibers. Diethylamine and pyridine did not produce any appreciable change in cellulose crysty. and moisture regain. Fiber bundle strength at zero and 3 mm. gage lengths was decreased slightly, particularly after prolonged trmt. Elongation and toughness of fibers were increased appreciably and fiber stiffness and DP were decreased. Aq. NaOH resulted in a sharp decrease in crysty. Bundle strength at 0-gage length was reduced by about 25% while that at 3 mm. gage length was not appreciably changed. Elongation and toughness increased appreciably while stiffness decreased correspondingly. Birefringence showed a sharp decrease while fiber swelling was increased after NaOH trmt. Aq.

KOH produced the max. decrease in crysty. Fiber bundle strength at 0-gage length was decreased appreciably while that at 3-mm. gage length showed a corresp. increase. Elongation and toughness increased while fiber stiffness. DP, and birefringence all decreased. Gen., most of the swelling and changes in the phys., structural, and optical props. were produced within 30 min. 46 ref. W.W.

1867. Pandey, S. N.; Iyengar, R. L. N.
CHEMICALLY MODIFIED COTTON. II. EFFECT OF DIFFERENT CONCENTRATIONS OF CHEMICALS ON CRYSTALLINITY AND CERTAIN OTHER PROPERTIES OF COTTON.
Textile Res. J. 39, no. 1: 24-31 (Jan., 1969); cf. ABIPC 40: abstr. 1866.

Samples of cotton from *Gossypium arboreum* and *G. hirsutum* were trd. with varying concns. of ethylamine, ethylenediamine, KOH, and LiOH. Increasing concns. of ethylamine up to 60% reduced the crysty. slightly, while the redn. was appreciable at concns. of 70% or more. Fiber bundle strength at zero and 3 mm. gage lengths showed gradual decreases with increasing ethylamine concn. Elongation and toughness showed slight increases at ethylamine concns. up to 60% and sharp increases from 70 to 90%. Stiffness and DP showed continuous decreases with increasing ethylamine concn. Birefringence showed a gradual decrease with increasing ethylamine concn. Ethylenediamine at concns. greater than 70% also reduced cellulose crysty. appreciably. Trmt. with 70% ethylenediamine decreased bundle strength at zero and 3 mm. gage lengths, stiffness, DP, and birefringence and increased moisture regain, elongation, and toughness in both cottons. Trmt. with KOH decreased fiber crysty. markedly up to concns. of 20%, fld. by a less marked decrease at higher concns. Fiber bundle strength at zero gage length was reduced while that at 3 mm. gage length was increased by trmt. with higher alkali concns. Elongation and toughness showed large increases while stiffness, DP, and birefringence showed gradual decreases with increasing KOH concn. Trmt. with LiOH decreased crysty. slightly at concns. up to 7% and more sharply at higher concns. Fiber bundle strength at zero and 3 mm. gage lengths, stiffness, DP, and birefringence decreased gradually while elongation and toughness increased gradually with increasing KOH concn. 10 ref.

W.W.

4584. Teppich, G.
INFLUENCE OF FINISHING CHEMICALS ON THE STRENGTH OF CELLULOSE FIBERS.
Textilveredlung 4, no. 4: 250-3 (April, 1969). [Ger.; Engl. sum.]

Data are presented showing the redn. in the DP of cotton cellulose caused by various textile chem. finishing trmts., incl. alkali pretrmt. (kier-boiling), bleaching (incl. hot vs. slop-pad bleaching and chlorite vs. peroxide bleaching), dyeing, post-chlorination, synt.-resin finishing, and formalization. 3 ref. L.G.S.

ABIPC Vol. 41

4041. Albrecht, W.
INFLUENCE OF FIBER, YARN, AND FABRIC PROPERTIES ON THE FINISHING BEHAVIOR OF FABRICS OF REGENERATED CELLULOSE.
Melliand Textilber. 51, no. 1: 64-71 (Jan., 1970). [Ger.]

The finishing behavior (particularly dyeing behavior) of viscose rayon fabrics is discussed as it is influenced by such factors as fiber DP, crimping, dye affinity, WRV, fineness, and presence of mat-finish agents. Yarn and fabric props. are also considered. L.G.S.

4402(U). Andreev, V. I.; Prokof'ev, N. S.
PROPERTIES OF CELLULOSE FIBERS OF *LARIX GMELINII*.
Sb. Tr. TNII Bumagi no. 4: 68-81 (1969). [Russ.; Engl. sum.]

A study was made of the props. of fibers of bisulfite pulps from larchwood and sprucewood which showed that larchwood pulp differs from sprucewood pulp in its chem. cpn., swelling capacity in water, and the flexibility of the fibers. In addn. to the fiber length and lignin content, the flexibility of the fibers depends on cellulose DP. The differences between the two pulps were reflected in the props. of papers: paper from larchwood pulp had a lower breaking length, elongation, and tearing strength, was more bulky, and had a higher capillary absorption and air permeability than paper made from sprucewood pulp. From: Ref. Zh., Khim. no. 9: abstr. S367 (May 10, 1970). J.S.

10222. Geller, B. E.; Polovnikova, M. V.; Tairov, M. Sh.; Vostrilova, N. V.; Sushkevich, T. I.; Sakalauskas, Z.; Grabauskas, V.
MOLECULAR WEIGHT DISTRIBUTION OF CELLULOSE TRIACETATE AND ITS EFFECT ON THE MECHANICAL PROPERTIES OF FIBERS.
Khim. Volokna 11, no. 5: 48-50 (1969). [Russ.]

This report deals with the study of the fractional cpn. of CTA, an improvement of the methods for the detn. of low-mol.wt. fraction content of CTA, and a study of the effect of the av. DP on the mech. props. of CTA fibers. A comparison of fractionation methods showed that the fractional pptn. of CTA from a 1% methylene chloride soln. with EtOH at 25 C. in the presence of ammonium thiocyanate is the most accurate. The precipitant is gradually added to a vigorously stirred CTA soln. The pptd. fraction is then sepd. by centrifuging at 3,000 rpm for 15-20 min. The fraction is dried at 105 C., then the intrinsic visc. and bound AcOH are detd. This method makes it possible to sep. CTA into 9 or more fractions. The av. statist. results of fractionating com. CTA showed good reproducibility by this method. Differential MWD curves showed that com. CTA samples have complex MWD patterns and indicate a considerable polydispersity of the polymer. A rapid and satisfactory method was devd. for sepg. fractions with a DP less than 100, which is based on dissolving such fractions in a mixt. of methylene chloride-EtOH contg. ammonium thiocyanate. More reproducible results are obtained by this method than by using an AcOH-n-hexane system. The effect of the av. DP on the mech. props. of CTA was detd. on freshly formed CTA fibers which were subjected to plasticization stretching in hot glycerol. The results showed that increasing the av. DP significantly improves the plasticization stretchability of the fibers and the mech. props., esp. of a fiber fatigue prop., such as brittleness. 14 ref. D.M.C.

4046. Kantouch, A.; Hebeish, A.; El-Rafie, M. H.
USE OF SODIUM CHLORITE IN SIMULTANEOUS DESIZING AND BLEACHING OF COTTON FABRICS.
Textilveredlung 5, no. 3: 220-3 (March, 1970). [Engl.; Ger. & Fr. sum.]

A new method is described for the simult. desizing and bleaching of cotton fabrics using Na chlorite. The method involves padding the fabrics with the Na chlorite soln. fld. by steaming. The trd. fabrics exhibit good tensile strength, high whiteness, and high wettability. Measurements of cellulose DP, Cu no., and COOH content revealed that marked degradation of the cotton was not involved. 12 ref. L.G.S.

1981(U). Paulauskas, A. P.; Spirikavichene, R. D.; Milyunaite, N. Yu.
CORRELATIONS BETWEEN THE VARIOUS PROPERTIES OF PHOTOCHEMICALLY DEGRADED TRIACETATE FIBERS.
Polimer. Mater. i ikh Issled., Kaunas, 1969: 139-42. [Russ.]

Correlation coeffs. were calcd. between the chem. and mech. props. of CTA fibers flg. their exposure to direct sunlight. A high deg. of correlation was found between the DP of the fibers and their tensile strength and elongation at break. There was also a good correlation between the content of bound AcOH and the crease resistance of the fibers. From: Ref. Zh., Khim. no. 6: abstr. S1472 (March 25, 1970). J.S.

ABIPC Vol. 42

6889. Kedzia, J.
DEGREE OF POLYMERIZATION OF CELLULOSE AS A MEASURE OF THE DEGREE OF AGING OF ELECTRIC INSULATION PAPER DURING SHOCK DRYING.
Przeglad Papier. 27, no. 5: 162-5 (May, 1971). [Pol.; Russ. & Engl. sum.]

In a study of the effects of "shock drying" (i.e., short-duration action of heat at temps. of over 135 C.) on elec. insulation papers, detns. of cellulose DP (viscometric) was used as a measure of the aging of paper during the process. It was found that the DP is more sensitive, compared to other props. (tensile and bursting strengths, Cu no., etc.), in the range of low degrees of aging, such as occur during drying. The method was applied to four elec. insulation papers, ranging in basis wt. from 95.6 (cable paper) to 14.2 g./sq.m. (thin condenser paper), and in d. from 0.60 to 1.18 g./cu.cm. The graphs presented show the % redn. of DP as a function of time at drying temps. ranging from 120 (conventional drying) to 200 C. In conventional drying at about 120 C., a drop of 10-20% in DP took place within 16 hr. At 200 C., there was a drop of 30% within 1 hr. The max. permissible temp. appears to be 180 C., at which a drop of DP of about 20% (considered permissible) takes place within 3 hr. for papers having a d. of more than 1, and within 1.5 hr. for papers having a d. of less than 1. At this temp. the drying time is 3% of that required for conventional drying, and the quality of exptl. condensers with shock-dried paper was comparable to that of com.

191. Mandel'baum, D. I.; Nikolaeva, N. S.; Bochkina, B. S.; Peker, Kh. S.; Chernomyrdina, V. P.
PULP REQUIREMENTS FOR POLYNOSIC FIBERS.
Khim. Volokna 11, no. 6: 24-6 (1969). [Russ.]

In order to det. the tech. requirements of pulp for polynosic staple fibers which have a breaking length of 36-40 km. and an elongation of 10-12%, a Swed. (Cordicel Super-20) and a domestic prehydrolysis kraft pulp with a high α-cellulose content (95.98% and 95.5%, resp.), and two domestic sulfite pulps with a slightly lower α-cellulose content (92.82% and 92.67%) were investigated. It was found that the viscy. and DP of one of the domestic sulfite pulps were highest, but the same pulp had the lowest α-cellulose content. Differences in the viscoses from the pulps were observed. The domestic kraft pulp gave a viscose which had the lowest viscy. and clarity. On examg. the fibers produced from the pulps in the wet state, it was found that the sulfite pulp with the lowest α-cellulose content gave fibers with the lowest rel. strength and elasticity modulus, and the highest soly. in NaOH soln. (100 g./liter). The yarn props. were also lower. The cheaper sulfite pulp can be used for the prodn. of polynosic staple fibers with somewhat lower props. in the wet state (rel. strength not lower than 70%). The results showed, however, that in order to obtain polynosic fibers with a breaking length of 36-40 km., an elongation of 10-12%, a rel. loop strength of not less than 13%, and a wet strength of 75%, it is recommended that a prehydrolysis kraft pulp be used which has an α-cellulose content of at least 95%, a resin, fat, and ash content not greater than 0.05%, a viscy. (1% cuam soln.) of 250 ± 25 mp., and a DP of 900-1000. 4 ref. D.M.C.

462(U). Oblak-Rainer, M.
STABILIZATION OF HEMICELLULOSES DURING ALKALINE DELIGNIFICATION OF WOOD.
Nova Proizv. 21, no. 2: 68-70 (1970). [Slovenian; Engl. sum.]

The possibility was investigated of stabilizing hemicelluloses and increasing their yield during soda and kraft pulping in the presence of oxidg. additives (Na polysulfide) and redg. additives (hydrazine, Na dithionite). The addn. of about 6% S (calcd. on o.d. wood) increased the pulp yield from single- and two-stage cooks, due to its higher content of glucomannans. The addn. of up to 4% hydrazine had a favorable effect on the delignification rate in both soda and kraft cooks, and increased the DP and brightness of the pulp. Stabilization of hemicelluloses, however, could be achieved only when a large amt. of hydrazine (10-20%) was added to the cooking liquor. Sodium dithionite had a similar effect, but no increase in pulp yield was observed. From: Ref. Zh,; Khim. no. 24: abstr. S436 (Dec. 25, 1970). J.S.

5542. Okajima, S.; Kurihara, K.; Yazawa, M.
BASIC STUDIES ON HIGH-TEMPERATURE CONTINUOUS BLEACHING OF COTTON. II. RELATION BETWEEN WHITENESS AND POLYMERIZATION DEGREE OF COTTON BLEACHED AT TEMPERATURES ABOVE 100 C.
J. Soc. Fiber Sci. Technol. Japan (Sen-i Gakkaishi) 21, no. 8: 448-51 (Aug., 1965). [Jap.; Engl. sum.] cf. ABIPC 42: abstr. 5541.

Cotton was subjected to high-temp. pad-steam bleaching with 1-1.5% Na chlorite at 110-160 C., pH 3.5-7, and a liquor ratio of 1:1 for 15 sec. to 20 min. The bleaching rate decreased markedly as the pH of the chlorite soln. increased, whereas the depolymn. rate was less affected by pH. However, the longer time needed to bleach at higher pH caused significant DP redns. Hence bleaching must be accelerated by lowering the pH to 3.5-5, in which case the depolymn. is tolerable. When bleaching was conducted at 110-120 C. for 30-60 sec. with 1.5% Na chlorite at pH 3.6, a Hunter brightness of 92 and a DP of 1100 (compared to 1270 for unbleached cotton) were obtained. It is concluded that high-temp. continuous pad-steam bleaching of cotton is feasible under appropriate conditions. 5 ref. C.L.B.

10137. Samaryanova, M. B.; Tovstoshkurov, E. M.; Sokol'nikova, V. A.
THERMAL STABILITY OF CABLE PAPER.
Bumazh. Prom. no. 10: 13-14 (Oct., 1971). [Russ.]

To study the heat resistance of cable paper (KV-120 grade), samples were heated to up to 150 C. in air, in vacuum, and in transformer oil with and without access of air. To compare the sensitivities to heat of the individual props. of paper (its mech. strength props., DP, Cu no., and pH), these props. were detd. in samples heated at 135 C. for various times. Folding endurance showed the greatest redn. during heating, the bursting strength the smallest. The sensitivity of the tearing strength was also high, and in the initial heating stage equal to that of folding endurance. For rapid evaln. of a cable paper, detns. of the tearing strength and DP after heating can be recommended (these two props. show analogous changes). Drying of

pulp lowers the resistance of cellulose to thermal oxidn., and cable paper made of such pulp has also a lower heat resistance. Taking the tearing strength as an index of heat resistance, five domestic cable papers from two mills and two Finn. samples were tested after heating at 160 C. for 10 hr. For each paper, 105 samples were tested, and the results were anald. statist.; the anal. showed a std. deviation of 2.8% in the measurements of tearing strength. According to the data obtained, the heat resistance of the papers from the Krasnyi Kursant mill is 9% lower, on the av., than that of papers from the Mariisk mill. This evidently should be attributed to the fact that the Mariisk mill uses its own pulp, while the other mill manufactures its papers from com. pulps. The effect of drying of pulp was confirmed by anal. of the pulps used at the Krasnyi Kursant mill. The heat resistance of the Finn. papers was of the same order as that of papers from the Mariisk mill. J.S.

ABIPC Vol. 43

1345. Hebeish, A.; Mashoor, R. A.; Kamel, M.
EFFECT OF PRETREATMENTS ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF COTTON CELLULOSE BEFORE AND AFTER DYEING DURING IRRADIATION. (1). EFFECT OF PRETREATMENTS ON THE PHOTO-DEGRADATION OF COTTON.
Am. Dyestuff Reptr. 60, no. 2: 39-42 (Feb., 1971).

The effects of pretrmts. used in mill practice (kier boiling, alkali boiling, bleaching, and mercerization) on some cotton cellulose props., before and after exposure to light, were investigated. The DP decreased and the Cu-no. increased with increasing no. of chem. trmts., while the tensile strength depended on the no. and type of pretrmts. and type of structural changes occuring. Kier boiling increased the susceptibility of cotton to radiation while subsequent bleaching and/or alkali boiling decreased it. Mercerized cotton was more resistant to radiation damage than untrd. cotton but later kier boiling and/or bleaching decreased its resistance. 20 ref. W.W.

11680. Mori, K.; Murakami, R.
MECHANICAL PROPERTIES OF GRAFTED PAPER. (1) VISCOELASTIC BEHAVIOR OF POLYVINYL ACETATE-GRAFTED PAPER. (2) DEPENDENCE OF MECHANICAL PROPERTIES OF POLYVINYL ACETATE-GRAFTED PAPER ON THE DEGREE OF SAPONIFICATION.
Japan Tappi 26, no. 8: 409-13; no. 9: 444-8 (Aug.-Sept., 1972). [Jap.; Engl. sum.]

The tensile, tear, and burst strengths of PVAc-grafted paper decreased with increased percentage grafting, due to weakening of interfiber bonds by copolymn. of the cellulose. The dynamic E′-modulus of grafted paper was lower than that of plain paper or PVAc film. The broadening of the viscoelastic absorption curve reflected the interaction between cellulose fibers and PVAc, but this interaction was less pronounced than in pulp sheets impregnated with PVAc. 4 ref.
Papers copolymd. with PVAc vs. PV alc. were examd. for mech. and viscoelastic props. With increased sapon. of PVAc, tensile and burst and esp. tear strength increased markedly; the dynamic E′-modulus also increased, and the mech. loss tangent decreased. In PV alc.-grafte; paper, tensile strength and E′-modulus increased with increased grafting percentages, whereas tear strength decreased. 2 ref. C.L.B.

11667. Nisiyama, M.; Matuo, R.; Oyama, S.
STUDIES ON THE MANUFACTURE OF SYNTHETIC-FIBER PAPER FROM GRAFT COPOLYMER. (2) GRAFTING OF ACRYLAMIDE TO PULP AND APPLICATION TO PAPERMAKING.
Japan Tappi 27, no. 2: 65-70 (Feb., 1973). [Jap.; Engl. sum.] cf. ABIPC 41: abstr. 1105.

Beaten and unbeaten bleached softwood kraft pulps were grafted with acrylamide, using ceric ion as initiator. The resulting hydrophilic pulps were made into paper without beating or binder addn. Among strength props. of unbeaten grafted pulps, the breaking length (tear strength) increased with increasing deg. of grafting, reached a max. at ca. 50% grafting, then dropped off. The burst factor reached a max. at 30-50% grafting; the max. tear factor was reached at 20-30% grafting deg. The grafting deg. of beaten pulps tended to decrease with increased beating deg. With increased grafting deg., their breaking length and burst factor passed through maxima, but their tear factor decreased. 4 ref. C.L.B.

4844(U). Samaryanova, M. B.; Sokol'nikova, V. A.; Leshchinskaite, G. I.
CHANGES IN THE POLYDISPERSITY OF CELLULOSE DURING HEATING.
Sb. Tr. TNII Bumagi no. 6: 63-6, sum. 205 (1971). [Russ.; Engl. sum.]

Cable paper made from unbleached kraft pulp (av. DP = 1800) and the same paper stabilized with 3.1% melamine or 2.5% o-phenylenediamine were heated for 192 hr. in air at 135 C. and for 320 hr. in insulation oil at 150 C. The MWD of the cellulose was then detd. by fractional pptn. from cadoxene solns. It was established that heating unstabilized cellulose changes its MWD with the formation of a significant amt. of the fraction with a DP of 400-1000, and that the conditions of heating have an effect on the nature of the changes in the fractional cpn. Heating cellulose in the presence of O results in the formation of a large amt. of a fraction with a DP of 500-700. The addn. of stabilizers to paper retards the degradation of cellulose during heating. After heating stabilized paper the max. in the MWD curve of cellulose is in the region of DP = 1500, while the fraction with a DP of 2000 constitutes 36% of the total. In unstabilized cellulose under the same conditions the fraction with a DP of 2000 is absent. From: Ref. Zh., Khim. no. 8: abstr. S496 (April 25, 1972). D.M.C.

8451. Stankovic, S.; Majdanac, L.
EFFECT OF SODIUM HYPOCHLORITE CONCENTRATION IN MULTISTAGE BLEACHING OF DISSOLVING PULP.
Tehnika (Belgrade) 26, no. 12: 1997-2001 (Hem. Ind. no. 12: 261-5) (1971). [Serbian; Engl. sum.]

Yugosl. dissolving pulp, obtained from beechwood by the aq. prehydrolysis kraft process, was bleached by two sequences, viz., CEH and CEHN (N is Na chlorite, used instead of chlorine dioxide because it is more convenient in lab. expts., while its effect is very similar to that of chlorine dioxide). The only variable in the two sequences was the concn. of NaOCl, which ranged from 0.5 to 2% active Cl, based on o.d. fibers. The bleached pulp samples were anald. for the flg.: yield, α-cellulose content, β- and γ-cellulose contents, DP (viscometric), brightness, crysty. (by x-ray diffraction and I sorption), and chlorine consumption. The data obtained are tabulated and presented in graphs in which all the above props. are plotted as functions of the active Cl concn. in NaClO. The graphs of the two bleaching sequences show gen. a similarity for the corresp. props. Curves of av. DP and brightness showed the largest deviation from linearity. The av. DP dropped sharply at hypochlorite concns. 0.5 and 1%, and only slightly at higher concns. Bleached pulp with the best props. was obtained by the CEHN sequence at a hypochlorite concn. of 0.5%. This pulp had a rel. high av. DP (1093), an α-cellulose content of 95.4%, and a satisfactory brightness (85.4%). The props. of the best bleached pulp were compared with those of the Am. Buckeye pulp and a Jap. pulp obtained from a mixt. of hardwoods. The DP of the domestic pulp was comparable to that of the Am. pulp, and higher than the DP of the Jap. pulp. Its crysty. was also higher than the crysty. of the Jap. pulp. Its reactivity (detd. by the amt. of insol. residue after emulsion xanthation) was about the same as that of the Jap. pulp, and lower than that of the Buckeye pulp (which is obtained from softwood). The domestic bleached pulp can be regarded as suitable for the mfr. of high-wet-modulus RC fibers. 15 ref. J.S.

11406. Swenson, H. A.
HOW FLEXIBLE IS CELLULOSE? APPLICATION OF VISCOSITY AND THE ELLIPSOID MODEL TO LOW-DP CELLULOSE IN CADOXENE.
Tappi 56, no. 2: 106-110 (Feb., 1973).

The viscy. vs. DP relationship of narrow fractions of low-DP cellulose was detd. in cadoxene. Considering the cellulose mol. both as a prolate and as an oblate ellipsoid, axial ratios (a/b) obtained from viscy. measurements were plotted against DP and compared to the axial ratio of a mol. model. The cellulose-cadoxene complex is shown to conform to the disklike oblate model at DP 1 for glucose. At higher DP, a gradual departure from the oblate toward the prolate model occurs, which provides evidence for apparently complex substitution at all available OH pairs along the macromol. chain. An estimate of the dimensions of the glucose-cadoxene complex is also given. A crit. bending length (169 A.) occurs at DP 31 in cadoxene, resulting apparently from the bulking effect of the complex and from the high viscy. of the cadoxene solvent. This effect is analogous to that found for flexible threads. This crit. bending length (which coincides with the fully extended contour length) is more than twice the persistence length (71 A.) found from viscometry in cadoxene at high DP. Computations based on the potential energy assocd. with the rotational angle in cellulose show that the macromol. is incapable of random coiling at no.-av. DP's below 2000, and indicate the inflexibility of the cellulose. Hence, conjectures on the organization of cellulose in cell walls must take into account that an unbending persistence length of 10-13 glucose units exists anywhere along the macromol. chain. 36 ref. C.L.B.

3875. Erdelyi, J.; Hernadi, S.
INVESTIGATION OF THE BEATABILITY AND SHEET STRENGTH PROPERTIES OF GRAFT-COPOLYMERIZED SPRUCE PULP.
Papiripar 16, no. 5: 176-9 (1972). [Hung.; Russ. & Ger. sum.]

Bleached spruce kraft pulp copolymd. with an unnamed vinyl monomer to varying degrees in a Ce(IV) initiator system at room temp. was beaten to different degrees and sheeted on a Rapid-Kothen app. in order to study the strength props. of the paper. The initial strength of the grafted pulp decreased as a result of the blocking of OH groups on the fiber surface. Sheet strength increased to a certain extent during beating, but the grafted pulp was more difficult to beat than the ungrafted pulp. Its beatability did not change significantly as a function of grafting degree (copolymer add-on). Breaking length increased up to about 40 min. of beating time, then remained rather const. with prolonged beating. It dropped significantly as the grafting degree was increased from 10 to 32%. The specific breaking energy dropped with prolonged beating for all grafting degrees. 4 ref. C.L.B.

3861. Gal'per, G. E.; Tsypkina, M. N.
EFFECT OF ALKALI TREATMENT OF CHIPS ON THE PROPERTIES OF CONSTRUCTIONAL FIBERBOARDS. (THIRD REPORT ON PROCESSES OCCURRING DURING THE MANUFACTURE OF CONSTRUCTIONAL FIBERBOARDS).
Sb. Tr. VNII Tsellyul.-Bumazh. Prom. no. 58: 100-10 (1971). [Russ.] cf. ABIPC 44: abstr. 3860.

It has been shown in the previous report that impregnation of chips with alkali prior to steaming in the mfr. of hardboards, does not prevent the condensation of lignin during steaming. The causes of the higher mech. strength of boards from alkali-impregnated chips, and the effect of the amt. of alkali sorbed on the board quality are the subjects of the present report. Sprucewood chips were impregnated under a pressure of 6 kg./sq.cm. with NaOH solns. ranging in concn. from 2 to 40 g./liter. The amt. of NaOH sorbed was calcd. considering the sorption of water from the solns. The sorption data were used to introduce a definite amt. of NaOH into the chips. Boards prepd. from chips contg. various amts. of alkali and from chips impregnated with water were tested for their mech. props. To det. the role of the wood components in the devt. of the mech. strength of the boards, boards were prepd. from holocellulose, isolated after fiberization, from the two types of matl., i.e., preimpregnated with water and with alkali, and the two types of refiner pulp were fractionated to det. the fiber length distribution. The sorption of alkali during forced impregnation of chips increased nearly linearly with the concn. of NaOH, and there was a corresp. increase of most of the mech. strength props. of the boards. There was a further increase of the mech. strength props. (with exception of impact resistance) after thermal hardening of the boards. Impregnation with alkali reduced the water resistance of non-hardened boards, increased that of heat-hardened boards. The flg. factors appear to be responsible for the higher quality of boards from alkali-impregnated chips: a better fiberization due to swelling of lignin in alkali; a greater content of glucomannan, attributable to its stabilization by alkali; and a higher DP of the carbohydrate complex, due to less hydrolysis during steaming. 11 ref. J.S.

6898. Kryazhev, V. N.; Naimark, N. I.; Pogosov, Yu. L.; Gavrilova, Z. A.
PHYSICO-MECHANICAL PROPERTIES OF CELLULOSE ACETATE-SUCCINATE.
Plas. Massy no. 1: 56-8 (1972). [Russ.]

Since cellulose acetate-succinate (CAS) is used as an alkali-sol. base for the prepn. of photopolymeric printing plates and layers, a study was made of the principal physico-mech. props. of plasticized and unplasticized CAS films as a function of their chem. cpn., DP, and plasticizer content. The results showed that the tensile strength, elongation, and folding endurance declined gradually for unplasticized films with increasing succinate substitution for both low (190-200) and high (330-350) DP values. With increasing succinate substitution the glass transition point steadily declined, while the brittleness point steadily increased in unplasticized CAS films. As the amt. of the plasticizer (dimethyl or diethyl phthalate) increased up to 40% of the wt. of the CAS, the glass transition points declined rapidly and the tensile strength decreased moderately, while the elongation passed through a min. point at approx. 10% for CAS with a succinate DS value of 50-55 (in gamma units) and at approx. 5% for CAS with a succinate DS value of 97, being at a substantially higher level for the former. The thermomech. curves for plasticized and unplasticized CAS films showed that the percent deformation increased at about the same rate as the amt. of plasticizer increased, but began rising at lower temps. A study of the thermal stability of

the films showed that with increasing temp. the COOH group content decreased and the ability of the films to dissolve in acetone also decreased. This indicated that cross-linking was taking place on heating. On the basis of the results, for alkali soly. with a max. retention of strength the optimum cpn. of CAS is a succinate DS value of 60-75 (in gamma units) (20-24% succinyl groups) and an acetate DS value of 170-180 (26-28% acetyl groups). Further increases in the succinate content do not improve soly. of CAS, but significantly lower its strength. 3 ref. D.M.C.

8048. Kudryavtseva, A. G.; Mogilevskii, E. M.; Papkov, S. P.
EFFECT OF ADDITIONS OF COTTON PULP ON THE STRENGTH OF VISCOSE RAYON FIBERS.
Khim. Volokna 14, no. 3: 50-1 (1972). [Russ.] cf. ABIPC 44: abstr. 6948.

A comparison was made of the mech. props., DP indices, and MWD curves of viscose rayon fibers made from kraft pulp alone vs. kraft pulp to which cotton pulp had been added. Fibers were obtained by mixing 3 parts of kraft pulp viscose with 1 part of cotton pulp viscose prior to wet spinning. Tabular data showed that there was an increase in the wt.-av., no.-av., and viscy.-av. DP values and heterogeneity in the fibers contg. cotton. The increase in the av. tensile strength was only 2.1%. The theoret. expected strength increase did not exceed 5%, which is practically insignificant. Integral and differential MWD curves showed that the cotton addn. increased the DP max. to 1000-1050. The differential curve became trimodal instead of bimodal. These results supported the previous conclusion that high mol.wt. fractions do not play any special role in increasing the strength of fibers by increasing the no. of bridges between the supramol. structures. 2 ref. D.M.C.

3583. Kudryavtseva, A. G.; Mogilevskii, E. M.; Papkov, S. P.
STRENGTH OF RAYON FIBERS AS A FUNCTION OF THE CELLULOSE CONTENT IN VISCOSE.
Khim. Volokna 14, no. 1: 33-4 (1972). [Russ.]

It has been reported that at low DP values the strength of rayon fibers increases with increasing cellulose content in the viscose (up to 12%), while at high DP values the max. fiber strength is achieved when the cellulose content is 6-8%. In order to probe these questions in greater detail, the strength of rayon fibers as a function of the cellulose content in two groups of viscoses was investigated. One group consisted of equiviscous soln. with different cellulose contents obtained by mixing various amts. of viscoses contg. 6.5% and 2% celluloses with the same viscy. (240-250 sec.). The other group consisted of viscoses with decreasing low viscosities and cellulose contents obtained by diln. with 4% NaOH. A fairly high fiber stretch was used (165%). The same coagulation bath was used for both groups of viscoses. The plots of fiber strength vs. cellulose content in the viscoses, showing scattered results, esp. at low cellulose contents, indicated that the higher the concn. of the polymer, the higher is the resistance of the freshly formed fibers to random disturbances of the formation process and the fewer are the deviations from the true strength resulting from random defects. Lines drawn through the upper and lower values indicated that the props. of fibers depend very little on the concn. of the viscose, since the upper curve changed very little with increasing amts. of cellulose in the viscose. The question of the effect of the DP of the cellulose on the fiber props. requires particular attention. 5 ref. D.M.C.

6948. Kudryavtseva, A. G.; Mogilevskii, E. M.; Papkov, S. P.
EFFECT OF HIGH MOLECULAR WEIGHT FRACTIONS ON THE PHYSICO-MECHANICAL PROPERTIES OF HIGH-MODULUS VISCOSE RAYON FIBERS.
Khim. Volokna 14, no. 2: 50-2 (1972). [Russ.]

A study was made of the effect of the addn. of cellulose with a high mol.wt. on the strength of fibers obtained by the viscose process from kraft pulps. Such addns. can either change the av. DP of the polymer or according to some opinions increase the no. of "bridging" chains between supramol. structures. Fibers were obtained by mixing 3 parts of viscose from kraft pulp with 1 part from cotton pulp, then spinning the fibers by the wet method in the usual manner. The physicomech. props. of the fibers were compared with the changes in the av. DP, which were detd. by the fractionation of samples dissolved in cadoxene by a method described in the lit. Tabular data were obtained of the wt. av., no. av., and viscy. av. DP values, and their rel. heterogeneity was calcd. The results indicated that the increased strength of the fibers is primarily the result of changes in the av. mol.wt. of the cellulose rather than by some special role played by the high mol.wt. fraction. 3 ref. D.M.C.

4768(U). Lichman, V. F.
CHANGES IN THE PHYSICO-CHEMICAL PROPERTIES OF PLANT FIBERS DURING CORRUGATION OF PAPER.
Novye Metody Ispyt. Kachestva Produktsii, Avtomat. Regulir. Protsessov Tsellyul.-Bumazh. Proizvod. 1972: 145-60. [Russ.]

The effects of corrugating conditions on the hygroscopicity and the phys. and chem. props. of pulps and on the deg. of order of the cellulose structure were examd. Changes in the phys. and chem. props. of plant fibers in the temp. range of 150-220 C. at a mech. pressure of 7.5 kg. do not have an adverse effect on the phys. and mech. props. of paper. The short-period appln. of high temps. and mech. pressures during corrugation decreases the hygroscopicity of the fibers and reduces the av. DP and deg. of crysty. of the cellulose. Hydrophobization of the fibers under optimum conditions of corrugation improves the com. props. of the corrugated layer of corrugated board (stabilization of rigidity) and also points to ways of reducing the consumption of adhesive for the sizing of paper. Expti. graphs are given on the relationship between the phys. and chem. props. of plant fibers and the increase of corrugating temp. From: Ref. Zh., Khim. no. 10: abstr. S1260 (May 25, 1973).

D.M.C.

1514. Mantri, T. C.; Fellegi, J.; Discantiny, P.; Gajdos, J.
INFLUENCE OF BLEACHING ON BEATING RESISTANCE OF SULFATE PULP.
Ippta 8, no. 3: 149-54 (July-Sept., 1971). [Engl.]

The main purpose of this study was to det. the resistance to beating of kraft pulps as affected by depolymn. caused during bleaching. A 6-stage bleaching sequence was used with a spruce sulfate pulp, and a special study was made of the hypochlorite stage (overall bleaching sequence: Cl/extn./hypochlorite/chlorine dioxide/extn./chlorine dioxide). The hypochlorite stage was varied with regard to its Cl content, and a ser. of the resulting bleached pulps were tested chemically and physically. The DP of these pulps decreased with increasing Cl charge in the hypochlorite stage. The tests showed that bleaching caused a substantial decrease in burst and tear factors. The mechanism of any strength improvement was shown by measuring the "external specific fiber surface" and the "effective sp. vol.". These increased when the severity of the bleaching decreased. The chem., phys., and microscopic studies indicate that pulps trd. moderately with hypochlorite lend themselves to fibrillation and improved strength props. in contrast to those in which the hypochlorite trmt. is severe. The latter, when beaten, undergo cutting and show reduced strength props. 10 ref.

L.E.W.

3908(U). Osipova, N. N.
PRODUCTION OF PULP BY OXIDATIVE DELIGNIFICATION WITH SODIUM CHLORATE. (2). REFINEMENT OF THE PARAMETERS OF THE TECHNOLOGICAL PROCESS.
Sb. Tr. VNII Tsellyul.-Bumazh. Prom. no. 60: 23-36 (1972). [Russ.] cf. ABIPC 44: abstr. 3909.

The operating conditions were refined for the prodn. of pulp from aspenwood by oxidative delignification with a soln. of Na chlorate according to the flg.: oxidn. with a soln. of Na chlorate in a mixt. with HCl, washing with a weak sulfurous acid soln., trmt. with a soln. of H peroxide in an alk. medium. It was shown that the addn. of the catalyst V pentoxide (optimally 0.5% of the wt. of the wood), 2% K dichromate or their mixt. accelerates the delignification process, increases the DP of the cellulose, and makes it possible to use fairly dd. HCl. It is not necessary to use high temps., high pressures, or long reaction periods for the delignification. Trmt. of the pulp with dil. sulfurous acid leads to a stabilization of the oxidized cellulose, eliminates foaming and the evoln. of toxic gases, and makes it possible to complete the delignification with a soln. of H peroxide in a weakly alk. medium. The upper limits of the pulp yield after the first stage and the processing temp. above which it is not possible to obtain a pulp which does not require mech. fiberization were established. Pulp was obtained in yields of 63-65% contg. less than 2% lignin with a DP of more than 900, a brightness of 85-86%, and with satisfactory mech. props. From: Ref. Zh., Khim. no. 3: abstr. S457 (Feb. 10, 1973). D.M.C.

1185(R). Perepechkin, L. P.
ADVANCES IN THE PRODUCTION AND USE OF ACETATE FIBERS.
Zh. Vses. Khim. Obshchestva 17, no. 6: 648-55 (1972). [Russ.]

The prodn. of CA fibers increases more rapidly than the prodn. of viscose rayon fibers: during the past decade the growth rates were 5.7 and 3.25%, resp., in the USSR, and 16.6 and 12.5% in the U.S.A. The high rate of growth is due mainly to increased prodn. of CDA continuous filaments and to devts. in the prodn. of CTA fibers. CA fibers have many valuable props., but they also have serious drawbacks, such as low tensile strength, low fatigue resistance, and static charges. In recent yr. considerable progress has been made in eliminating these drawbacks through the use of cellulose with a high DP, modifications in the mfg. process, copolymn. of CA fibers, etc. These recent devts. are revd. 48 ref.

J.S.

8294(U). Perl'shtein, E. Ya.
CHANGES IN THE AVERAGE DEGREE OF POLYMERIZATION OF VARIOUS FIBERS IN PAPER DURING THERMAL AGING.
Vop. Dolgovechnosti Dokumenta 1973: 13-16. [Russ.]

Samples of paper prepd. especially for studying the process of aging were investigated. Changes in the av. DP of the cellulose in the paper were indicative of the processes which take place during the thermal aging. The process primarily involves the degradation of the high mol.wt. fractions, as evidenced by a lowering of the av. DP, since the degradation of the low mol.wt. fractions takes place at a much slower rate than that of the high mol.wt. fractions. Shown was the effect of the type of fibers (sulfite and kraft pulp from cotton and flax), as well as the presence of fillers and sizing matls. in paper, on the changes in the DP of the cellulose in paper during thermal aging. From: Ref. Zh., Khim. no. 16: abstr. S1161 (Aug. 25, 1973).
D.M.C.

6970. Tsuji, W.
LOWERING OF THE TENSILE STRENGTH OF COTTON FIBER CAUSED BY INTERMOLECULAR CROSS-LINKING.
Bull. Inst. Chem. Res., Kyoto Univ. 49, no. 2: 69-79 (1971). [Engl.]

Resin treatment to provide crease resistance causes a loss of tensile strength in cotton fabrics but not in rayon. The difference is explained on the basis of the higher DP and higher degree of crystallinity in cotton. Cross-linking in cotton restrains the mobility of the cellulose molecules and stress concns. occur. Good crease resistance with minimal strength loss was obtained when cotton grafted with acrylic acid was cross-linked with tris(1-aziridinyl)phosphine oxide using zinc borofluoride as catalyst. 10 ref. M.B.